TransDominion Express Study Update
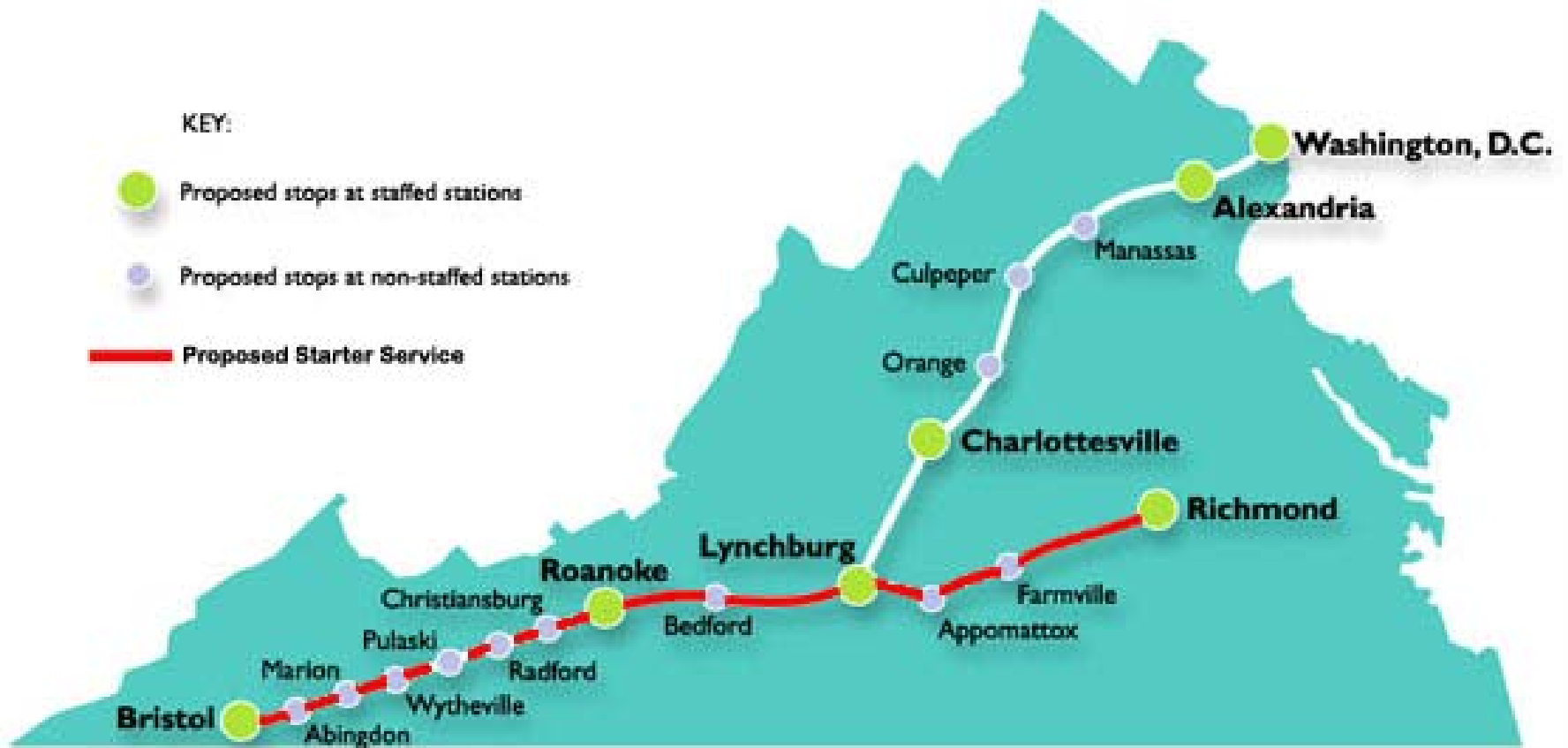
Commonwealth Transportation Board

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Virginia Transportation Research Council

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TransDominion Express
Proposed Route and Stations

KEY:

⦿ Proposed stops at staffed stations

⦿ Proposed stops at non-staffed stations

▬▬ Proposed Starter Service

Stations: Washington, D.C.; Alexandria; Manassas; Culpeper; Orange; Charlottesville; Richmond; Lynchburg; Farmville; Appomattox; Bedford; Roanoke; Christiansburg; Radford; Pulaski; Wytheville; Marion; Abingdon; Bristol

TDX Corridor Information

- ❑ **Rail Lines**
  - Ownership: All Norfolk Southern except:
    - 8 miles: Alexandria – Union Station (CSX & Amtrak)
    - 1 mile into Richmond Main St. Station (CSX)
  - Mileage:
    - Washington, D.C. – Lynchburg   204 miles
    - Richmond – Lynchburg   130 miles
    - Lynchburg – Bristol   <u>201 miles</u>

            Total Miles :   535 miles

- ❑ **VRE Operations**
  - 16 trains/day on Manassas Line– join CSX in Alexandria
  - 6 stations on the NS Line
  - Ridership: 6,800 Manassas Line/Day

- ❑ **Amtrak Operations**
  - Washington, DC to Lynchburg: 3 trains/day
  - Approximately 100,000 riders/year

- ❑ **Norfolk Southern Operations**
  - 15–20 through trains/day. Additional local trains throughout the corridor.

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2006 General Assembly Report

General Assembly directive
(Item 438.B of HB 5002):

❑ Provide an update on project status

❑ Revise revenue projections

❑ Revise capital and operating cost information

❑ Provide information on the project's potential benefits to alleviate congestion

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TDX Status Today

❑ The Virginia Transportation Act of 2000 provided approximately $9.3 million for capital improvements related to Bristol passenger rail service

❑ However, these funds have not been expended due to the following impediments:

– No governing entity has been created and an agreement with Norfolk Southern has not been executed to allow operations

– No ongoing source of capital and operating funds has been identified to further advance TDX into operations

❑ No operating funds have been identified for this service to-date

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TDX Previous Studies

1996   DRPT report to General Assembly

1998   Report by Frederic R. Harris, Inc. at the request of DRPT for a General Assembly funded study

2000   Amtrak Study

2002   Woodside study at the request of Norfolk Southern and DRPT

2005   Pilot Project report to the General Assembly by DRPT

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Comparison of Previous Study Data

❑ Estimated annual operating subsidies varied in these studies, ranging from $9 million to $23 million depending on the type of service presumed and the ridership level

❑ Capital costs were estimated in greatest detail in the 2002 study and were generally used in the 2005 DRPT study

❑ Greatest variation in studies concerned ridership estimates:
  – Lowest: Amtrak study at 26,000
  – Highest: 1996 DRPT study at .5 million

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Disparity in Previous Studies (1)

Study (year)	Annual Ridership Forecast	Capital Investment Required
HD 51 (1996)	520,000	$54 million
Frederic R. Harris, Inc., (1998)	372,100	$9.3 million
Amtrak (2000)	26,252 (modified) 40,750 (alternate)	Not given
Woodside (2002)	Not given	$120 million
HD 37 (2005)	Not given	$120 million

Disparity in Previous Studies (2)

❑ F.R. Harris (1998)

- – Presumed the use of tilt technology to achieve faster service times

❑ Amtrak (2000)

- – Presumed modern tilt technology was infeasible, thus used slower service times

❑ Overall, assumptions about service times explain *part* of the discrepancy

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Sensitivity of Ridership to Service Levels (1)

Segment	F.R. Harris (1998) Two trains daily	Amtrak (2000) one train daily
Bristol to D.C.	7:44	8:18
Lynchburg to Richmond	2:25	2:41
Richmond to DC	6:47 (via Lynchburg)	2:14
Total ridership	374,400	40,750

Sensitivity of Ridership to Service Levels (2)

❑ Previous studies assumed different service times

❑ Previous studies assumed different sensitivities to the same service times

❑ Some, but not all, details of previous studies are available

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1. Estimate <u>potential</u> trips that could be taken by rail or auto.

2. Distribute <u>potential</u> trips between stations.

3. Determine <u>fraction of potential trips</u> taken by rail.

> We recognized warnings from the literature that forecasts have often been in error, and these warnings are noted in the report.

Estimating Potential Trips

❑ Examined four market segments:

– College students

– Tourists

– Zero-vehicle households

– Business trips

❑ Assumed that a station could serve the city or surrounding county

– Example: Station in Charlottesville could serve tourists visiting sites in Charlottesville or Albemarle County

Example of Estimating Trips

❑ Consider the "college student" market segment

❑ Consider the Roanoke station

❑ Hollins University and Roanoke College have a combined 1,533 in-state students, an estimated 45%, or 689, of whom have homes served by a TDX station.

❑ This group can be expected to make 5,514 total trips between home and school during the school year.

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Distributing Potential Trips between Stations

❑ Applied gravity model to trips generated by each jurisdiction where a TDX station was housed.

❑ Focused on trips between six stations that generated the highest number of trips and were geographically diverse.

❑ These stations were Radford, Roanoke, Lynchburg, Charlottesville, Richmond and Alexandria.

Potential Nonbusiness Trips Between Stations

	Radford	Roanoke	Lynchburg	Charlottesville	Alexandria	Richmond
Radford	--	39,045	9,819	7,423	89,261	30,472
Roanoke	39,045	--	30,855	16,579	164,163	65,366
Lynchburg	9,819	30,855	--	16,785	143,714	55,233
Charlottesville	7,423	16,579	16,785	--	234,962	104,196
Alexandria	89,261	164,163	143,714	234,962	--	1,458,925
Richmond	30,472	65,366	55,233	104,196	1,458,925	--

Example: between Lynchburg and Alexandria, there are 2(143,714) = about 300,000 annual trips. Some are by rail and some are by car.
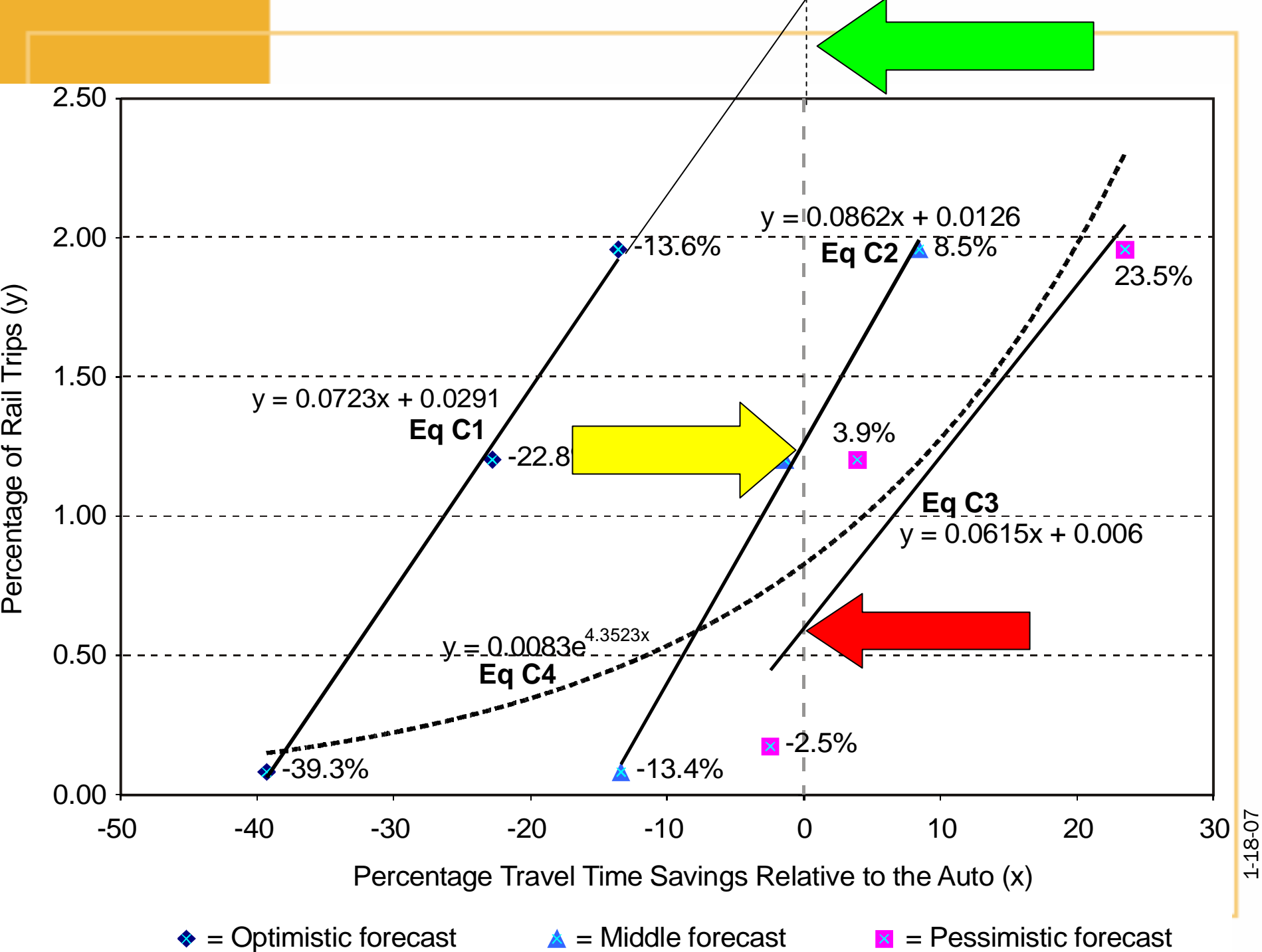
Determining the Fraction of Potential Trips by Rail

❑ Compared rail service times from the 2002 Woodside Report to auto service times

❑ Often auto is faster, but not always

❑ Examples of segments and travel times

Segment	Auto	Rail
Alexandria-Lynchburg	208 min	190 min
Lynchburg-Richmond	142 min	175 min

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Determining the Fraction of Potential Trips by Rail (2)

❑ Suppose that rail and auto service times were exactly equal for a particular route.

❑ Consider data from previous studies (see chart on next slide)

  – One set of data suggests that about 0.5% of trips would be by rail (red at bottom)

  – Another set of data suggest that 1.2% trips would be by rail (yellow in middle)

  – A third set of data suggests that 3% of trips would be by rail (green at top)

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Percentage of Rail Trips (y)

2.50

2.00

1.50

1.00

0.50

0.00

y = 0.0862x + 0.0126
Eq C2

y = 0.0723x + 0.0291
Eq C1

-13.6%

8.5%

23.5%

3.9%

-22.8

Eq C3
y = 0.0615x + 0.006

y = 0.0083e^{4.3523x}
Eq C4

-39.3%

-13.4%

-2.5%

-50   -40   -30   -20   -10   0   10   20   30

Percentage Travel Time Savings Relative to the Auto (x)

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◆ = Optimistic forecast   ▲ = Middle forecast   ☒ = Pessimistic forecast

Rail Trips by Station Per Year

	Radford	Roanoke	Lynchburg	Charlottesville	Alexandria	Richmond
Radford	--	0 to 301	0 to 29	0 to 14	0 to 910	0 to 14
Roanoke	0 to 262	--	0 to 1849	0 to 202	0 to 3,446	0 to 41
Lynchburg	0 to 34	0 to 2,290	--	1,235 to 3,228	1,919 to 5,639	0 to 1051
Charlottesville	0 to 13	0 to 162	859 to 2,785	--	3,737 to 10,244	0
Alexandria	0 to 748	0 to 3,194	1,556 to 5,212	3,498 to 9,964	--	0
Richmond	0 to 17	0 to 51	0 to 1051	0	0	--

2006 Ridership Forecast Summary

❑ Annual ridership is 14,000 to 58,000

❑ Most of the effort for this study went into the ridership forecast

❑ Our contribution was to fully document how the forecast was done, so that projected and actual values may be compared in the future should TDX move forward

❑ Computational details are also available at http://www.vtrc.net/tdxforecasts/

Updating Operating and Capital Costs

❑ Capital costs

    – Used AAR Railroad Index to update most rail capital costs

    – Used FHWA Construction Composite Index to update rail-grade crossing capital costs

❑ Operating Costs

    – Used figures from 2002 operational study

❑ All costs were converted to 2010 dollars

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Updated Operating and Capital Costs in 2010 dollars

❑ Capital costs:　　　　　$206 M

❑ Operating costs:　　　　$19 M annually

❑ Revenues:　　　　　　　$0.4 to $1.8 M annually

Revenues assume 25 cents/passenger mile

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Congestion Reduction Benefits

❑ Some highways that parallel TDX, such as Route 29 in Nelson Co., are relatively uncongested, so benefits at those locations are minimal.

❑ Route 29 in Prince William Co. carried approximately 48,000 vehicles **per day** in 2005 between Fauquier Co. and US 15. The upper end of ridership on the entire TDX is projected to be just slightly greater **per year**. Under the most optimistic forecast, TDX could take approximately 125 vehicles from this highway on a daily basis.

❑ One reason for less congestion reduction benefits is that some highways have substantially more local trips than through trips.

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Approaches to Comparing Benefits and Costs

❑ Midpoint ridership of 36,000 annually

❑ Midpoint revenues of $1.143 million

❑ Operating costs of $19 million

❑ Subsidy of **$3.91** per passenger mile

Approach to Comparing TDX Benefits and Costs(1)

❑ Consider other benefits than congestion reduction, for markets such as tourists and non-vehicle households

❑ Literature suggests that vehicle use exacts an unpaid cost from crashes, energy, noise pollution, air pollution, parking, user costs and infrastructure investments ranging from 3.4 to 55.3 cents/passenger mile.

❑ Could compare this range of social costs to the operating subsidy required

❑ With an operating subsidy of $3.91 per passenger mile, assuming that every TDX passenger mile replaces an automobile passenger mile and the highest social cost of 55.3 cents, the cost of TDX would not justify the investment.

Approach to Comparing TDX Benefits and Costs (2)

❑ The justification for investment through this social costs model could be feasible if any of the following were to occur:

– Costs to the public sector were reduced by sharing costs with the private sector

– TDX ridership were to rise beyond the level of 36,000 riders

– Social costs of auto travel were estimated to be higher than 55.3 cents per passenger mile

❑ Given the variation in demand between stations and the variation in capital costs required to accommodate service between stations, it is possible that certain corridors of TDX might have a higher ratio of ridership to costs (and a lower subsidy) than other corridors

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Possible Action Plan

1. Decide whether pilot service should be offered.

2. Choose a corridor for service.

3. Identify minimal infrastructure and rolling stock requirements for service.

4. Develop a detailed ridership test for service.

5. Investigate options for selecting an operator for full service.

6. Create an incentive structure for that operator to provide high-quality service.

7. Identify possible funding sources for full service.

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Possible Action Plan (cont'd)

❑ <u>Steps 1 and 2</u>

  – Some corridors have relatively high demand (e.g., 38% of the total TDX ridership is estimated to be between Charlottesville and Alexandria or 70% of TDX ridership is between Lynchburg and Alexandria)

❑ <u>Step 4</u>

  – If TDX is offered, compare actual ridership levels to projected ridership levels

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Possible Action Plan (cont'd)

❏ <u>Steps 5 and 6</u>

    – Other operators (e.g., Capital Corridors in California) have noted that incentives (such as bonuses for on-time performance) are quite helpful

❏ <u>Step 7</u>

    – All systems studied in this report (California, Cascades in Washington/Oregon, Piedmont in North Carolina, Downeaster in Maine) require an operating subsidy.

2006 General Assembly Report
Summary of Key Findings

❑ Capital cost estimate: $206 M

❑ Operating cost estimate: $20 M/year

❑ Estimated ridership: 14,000 – 58,000/year

❑ Estimated farebox revenue: $0.4 - $1.8 M/year

❑ TDX offers little benefit in terms of reducing travel congestion

❑ The status of TDX has not changed since publication of the 2005 report

❑ Two regional rail initiatives could affect the feasibility of TDX:

  – Heartland Corridor Initiative

  – I-81 Rail Corridor Study and subsequent improvements

Note: All costs in 2010 Dollars

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